this appears, it will not be a thick volume with wide margins and soft-finish paper, but a handy little manual, cheap enough to be worth buying.

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Laws of Wages. An Essay in Statistical Economics. By HENRY LUDWELL MOORE. New York: Macmillan, 1911. 8vo, pp. viii+196. $1.60.

In *The Distribution of Wealth* Professor J. B. Clark made the prophecy that "the largest and most permanent work of the future must consist of historical and statistical studies, directed by a full knowledge of economic law." During the present year two important statistical studies of the kind referred to have appeared, i.e., Fisher's *The Purchasing Power of Money* and Moore's *Laws of Wages.*

In the latter work Professor Moore has added his prophecy, with which the reviewer concurs, to that of Professor Clark. "There are," he says, "five circumstances the coexistence of which at the present time will probably determine in the near future the direction and character of such economic investigations as shall have for their object the discovery of general facts and laws." The circumstances are, first, "the pure theory of economic statics has reached a definite, mathematically symbolic form"; second, "Marxian socialists . . . . are seeking to extend the theory of socialism through the development of the constructive idea in the light of concrete data"; third, "the material for the concrete treatment of economic questions is being supplied yearly in increasing abundance"; fourth, "the invention of a calculus of mass phenomena"; and fifth, "the perfection of mechanical devices for performing mathematical computations" (pp. 1–5).

The *Laws of Wages* shows the fruitful application of the newer statistical methods in testing the productivity theory of wages. The theory according to which, under perfect competition, the laborer tends to receive as wages "the value of his specific product" (p. 7) is tested by the computation of the Pearsonian coefficients of correlation, mean contingency, and mean square contingency on the basis of suitable data taken from France, Italy, and the United States, but especially from the former countries.

The study opens with a clearly written chapter on the nature of statistical laws as illustrated by Pearson's "scatter diagram," the straight line that best "fits" the scattered points, and the coefficient of

correlation. The value of the book to the non-mathematical economist would have been increased had the author given even more extended and profusely illustrated explanations of the mathematical concepts which he uses. These explanations might have appeared in an appendix.

Probably the mathematical character of the *Laws of Wages* will repel many readers who are interested in the subject of wages. However, the mathematical machinery used is of such importance and capable of such general application that it is well worth the time and effort of economists to acquire. Luckily a book has appeared during the year, i.e., Yule's *An Introduction to the Theory of Statistics*, which explains the concepts of the calculus of mass phenomena as simply as may be. The possible objection of Professor Edgeworth that "the mathematical method is a machinery, the use of which is very liable to be overbalanced by the cost to others than the maker of acquiring it"[1] does not hold against acquiring a notion of the important methods of measuring correlation as used by Professor Moore.

The author gives such a clear exposition of the meaning of important terms in general use that an extended quotation is justified:

> By a progressive synthesis a statistical investigation passes from individual observation to representative facts and from representative facts to statistical laws. The representative facts exhibit the characteristics of the individual observations which, for the purpose in hand, are most useful. . . . . The hypothesis or theory in each case is the supposition as to the nature of the relation of the representative facts. The law of the facts . . . . is the supposition that satisfies best the accepted standard of simplicity and excellence of fit of the facts to the hypothesis (p. 20).

Thus the author's conception of economic law is pragmatic. With this conception the reviewer is in entire accord.

The conclusions drawn from the author's statistical tests support the productivity theory of wages. The results of those statistical tests based, of course, upon data pertaining to restricted localities and specific industries, may be stated generally as follows:

1. Wages of unskilled laborers are not determined by the cost of the means of subsistence (pp. 32, 176).

2. Wages of unskilled laborers are not determined by their standard of life, although the correlation between the two is moderately high (pp. 41, 176).

[1] Palgrave, *Dictionary of Political Economy*, article on "Mathematical Methods in Political Economy."

3. Wages of unskilled laborers and wages of skilled laborers are very closely correlated, the coefficient of correlation being 0.775 (pp. 39, 176).

4. "The fluctuation in the mean daily rate of wages varies directly with the fluctuation in the mean value of the daily product of the laborer," the coefficient of correlation being 0.843 (p. 55).

On a later page Professor Moore states the same conclusion as follows: "average wages increase with the specific product of labor" (p. 177). The second statement is justified only if "the specific product of labor" is taken to mean the money value of the product of labor. In the statistics put to test (data from French coal mines) the "specific product of labor" is measured in money, and therefore varies as the price of the product varies. In a still later place the author says: "A new theory of wages, definite in form and admitting of empirical tests, has been developed as a part of a general efficiency theory of distribution." Thus there is a transition from "mean value of the daily product of the laborer" to "the specific product of labor," and finally to "efficiency."

5. The more rapid the increase of capital in an industry (as measured by machine power in the statistical test) the more rapidly do wages increase (pp. 66, 177).

6. The curve of distribution of ability coincides with the curve of distribution of wages (chap. iv, p. 182).

7. Since "an increase in the efficiency of the worker will tend to increase his wages," a strike for increased wages will be apt to succeed if it is based upon increased efficiency, but "without the increased efficiency no amount of striking will result in a permanent increase of wages" (pp. 134, 188). As stated previously (No. 4), "efficiency" is measured by the money value of the product.

8. "As regards the four critical items—rate of wages, amount of employment, continuity of employment, and length of the working day—the status of the laborer improves with the increasing concentration of industry" (p. 193). There is a moderate degree of correlation between the size of the establishment and the rate of wages (the coefficient of mean square contingency, $C_1 = 0.318$), a lower degree of correlation between the age of the worker and the rate of wages ($C_1 = 0.250$), and a very high degree of correlation between the size of the establishment and the amount of employment ($C_1 = 0.791$ or 0.785, depending upon the system of weighting).

Professor Moore's conclusions are justified. However, the conclusions numbered 1 to 6 are much more strongly supported by the data

used than are the conclusions numbered 7 and 8. In the latter cases the results are obtained by the use of contingency tables which, in the majority of cases, do not contain more than 3×5 compartments. The coefficient of mean square contingency has the disadvantage that coefficients calculated on different systems of classification are not comparable with each other, i.e., the coefficient has different maximum values depending on the multiplicity of classes. As a consequence of this disadvantage Professor Yule gives the caution that "it is as well, therefore, to restrict the use of the 'coefficient of contingency' to 5×5-fold or finer classifications."[1] The quotation of Professor Yule's caution must not be construed to indicate that the reviewer objects to Professor Moore's use of the coefficient of contingency. There is no better method of procedure than the one adopted by the author. Indeed, the reviewer considers the chapters on "Wages and Strikes" and "Wages and the Concentration of Industry" the closest scientific studies of those subjects that have appeared.

Perhaps the most important of Professor Moore's conclusions is the one which the reviewer has numbered 4: "The fluctuation in the mean daily rate of wages varies directly with the fluctuation in the mean value of the daily product of the laborer." On p. 138 the author says: "The essential idea of the new doctrine is that, with a definite technical and social organization of industry, the laborer tends to get what he produces." A cause-and-effect relation thus appears to be implied. "Specific productivity" appears to be designated as the cause of the laborer's rate of wages. However, in his introduction (p. 2) Professor Moore expressly stated that

economic events are not arrayed in linear connection, the one event following the other in direct series, as was frequently assumed by the classical economists. It was an idle controversy that Malthus and Ricardo conducted upon the question whether the abundance of food increases the population or the multitude of consumers increases the supply of food. Social phenomena are interrelated, are mutually dependent, and the appropriate method of treating such a form of interdependence is the use of a system of simultaneous equations in which the equations are equal in number to the unknown quantities in the problem.

Taking the author at his word, then, his study no more indicates that specific productivity fixes wages than it indicates that wages fix specific productivity. We might, therefore, change the author's conclusion to the following: the essential idea of the new doctrine is that, with a definite

[1] Yule, *Theory of Statistics*, p. 66.

technical and social organization of industry, *the laborer tends to produce what he gets*.

Perhaps a few words in regard to the coefficients used in *Laws of Wages* would not be out of place. The coefficient of correlation is familiar. It has become standardized. It affords the best means for measuring the extent of correlation between two series of paired measurements; its numerical value varies between -1 and $+1$. Professor Pearson's coefficients of mean square contingency and mean contingency are not as familiar. These coefficients were originated for the purpose of measuring the correlation, or technically, contingency, where the data in question are in the form of a double-entry table, but this double-entry table differs from a correlation table in having non-numerical headings for the columns or the lines, or both. In other words, a coefficient of contingency is a "method of finding correlation in the case of quantitatively non-measurable characters."[1] Professor Pearson states the relationship between mean square contingency and correlation in the case of normal frequency as follows:

(i) That since the mean square contingency is absolutely independent of the arrangement of our classes, the coefficient of correlation is also entirely independent of the arrangement of our classes on the basis of any assumed order or scale.

(ii) Provided our classes are sufficiently small to allow of us legitimately replacing by groupings over small areas the theoretical integrations, the coefficient of correlation can be found from the mean square contingency.[2]

Both the coefficients of mean square contingency and mean contingency are theoretically equal to the coefficient of correlation—on the hypothesis of normal frequency—when the grouping is small enough so that there is a sufficiently *large* number of classes. For instance, in a 10×10-fold classification the coefficient of mean square contingency cannot exceed 0.949. As previously stated, Professor Yule suggests that the coefficient of contingency be restricted to 5×5-fold or finer classifications.

Professor F. Y. Edgeworth has given a concise statement of the service which mathematics may render to political economy.[3] That service may be threefold: First, "the mere statement of an economic problem in a mathematical form may correct fallacies." Second,

[1] *Drapers' Company Research Memoirs.* "On the Theory of Contingency and Its Relation to Association and Normal Correlation." By Karl Pearson. P. 8.

[2] *Ibid.*

[3] Palgrave, *op. cit.*

"attention is directed to the data which would be required for a scientific solution of the problem." Third, "the mathematical method is useful in clearing away the rubbish which obstructs the foundation of economic science, as well as in affording a place for the more regular part of the structure." Professor Moore's *Laws of Wages* gives striking service in all three lines.

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Wages in the United States, 1908–1910: A Study of State and Federal Wage Statistics. By SCOTT NEARING. New York: Macmillan, 1911. 8vo, pp. viii+220. $1.25.

After a search through the labor statistics recently published by different federal and state bureaus, Professor Nearing has brought together in this little volume such data as he has thought of value in solving the question of what the wages, or rather the earnings, of labor have been during the period 1908–10. His conclusion, based upon "the available sources of statistics, and by inference for neighboring localities," and with a deduction of 20 per cent for unemployment, is that east of the Rockies and north of the Mason and Dixon Line, "three-quarters of the adult males and nineteen-twentieths of the adult females actually earn less than $600 a year." It is important to note, however, that in one of the early chapters of the book it is pointed out that "any accurate answer to the question 'What wages are paid?' will be impossible" until some uniform system of collecting or presenting wage statistics has been "widely adopted" among the different states.

The three states that at present furnish wage statistics from which "scientific deductions are possible" are Massachusetts, New Jersey, and Kansas. Herein, of course, lies the crux of the difficulties that confront the writer of a volume like the one in hand. Data cannot be obtained from the states or the sections which one would select as the most important. The industrial statistics of Kansas are presented, not because Kansas is a more representative industrial state than New York, but because data from Kansas are available and suitable data cannot be obtained from New York. How far one wishes to accept conclusions drawn from Kansas data is of course open to every reader to decide.

Professor Nearing also presents the results of a study of certain federal and state reports on special industries. Here again the same difficulty is encountered. The wages paid in the telephone industry in